

```

1          TITLE 'Copysys - updated sysgen program 6/82'
2          ; SYSTEM GENERATION PROGRAM
3 001E =    VERS EQU 30          ;VERSION X.X FOR CP/M X.X
4          ;
5          ;*****
6          ;*
7          ;*
8          ;*      COPYSYS SOURCE CODE
9          ;*
10         ;*
11         ;*****
12         ;
13 0000 =    FALSE EQU 0
14 FFFF =    TRUE EQU NOT FALSE
15         ;
16         ;
17 001A =    NSECTS EQU 26        ;NO. OF SECTORS
18 0002 =    NTRKS EQU 2          ;NO. OF SYSTEMS TRACKS
19 0004 =    NDISKS EQU 4         ;NO. OF DISKS DRIVES
20 0080 =    SECSIZ EQU 128       ;SIZE OF SECTOR
21 0007 =    LOG2SECT EQU 7      ;LOG2 128
22 0002 =    SKEW EQU 2          ;SKEW SECTOR FACTOR
23         ;
24 005C =    FCB EQU 005CH        ;LOCATION OF FCB
25 007C =    FCBCR EQU FCB+32    ;CURRENT RECORD LOCATION
26 0100 =    TPA EQU 0100H       ;TRANSIENT PROGRAM AREA
27 1000 =    LOADP EQU 1000H      ;LOAD POINT FOR SYSTEM
28 0005 =    BDOS EQU 05H        ;DOS ENTRY POINT
29 0000 =    BOOT EQU 00H        ;REBOOT FOR SYSTEM
30 0001 =    CONI EQU 1H         ;CONSOLE INPUT FUNCTION
31 0002 =    CONO EQU 2H         ;CONSOLE OUTPUT FUNCTION
32 000E =    SELD EQU 14         ;SELECT A DISK
33 000F =    OPENF EQU 15        ;DISK OPEN FUNCTION
34 0010 =    CLOSEF EQU 16       ;OPEN A FILE
35 0015 =    DWRITF EQU 21       ;WRITE FUNC
36 0016 =    MAKEF EQU 22        ;MAE A FILE
37 0013 =    DELTEF EQU 19       ;DELETE A FILE
38 0014 =    DREADF EQU 20       ;DISK READ FUNCTION
39 0032 =    DRBIOS EQU 50        ;DIRECT BIOS CALL FUNCTION
40 0080 =    EIGHTY EQU 080H     ;VALUE OF 80
41 0003 =    CTLC EQU 'C'-'@'    ;CONTROL C
42 0059 =    Y EQU 89            ;ASCII VALUE OF Y
43         ;
44 0001 =    MAXTRY EQU 01        ;MAXIMUM NUMBER OF TRIES
45 000D =    CR EQU 0DH          ;CARRIAGE RETURN
46 000A =    LF EQU 0AH          ;LINE FEED
47 0016 =    STACKSIZE EQU 016H ;SIZE OF LOCAL STACK
48         ;
49 0001 =    WBOOT EQU 01        ;ADDRESS OF WARM BOOT
50         ;
51 0009 =    SELDSK EQU 9         ;BIOS FUNC #9 SELECT DISK
52 000A =    SETTRK EQU 10        ;BIOS FUNC #10 SET TRACK
53 000B =    SETSEC EQU 11        ;BIOS FUNC #11 SET SECTOR
54 000C =    SETDMA EQU 12        ;BIOS FUNC #12 SET DMA ADDRESS
55 000D =    READF EQU 13        ;BIOS FUNC #13 READ SELECTED SECTOR
56 000E =    WRITF EQU 14        ;BIOS FUNC #14 WRITE SELECTED SECTOR

```

*CP/M Plus Ver 3.0*

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SER. # *CP3-135*

```

57
58 ;
59 0100      ORG      TPA          ;TRANSIENT PROGRAM AREA
60 0100 C35704 JMP      START
61 0103 0000000000 DW      0,0,0,0,0,0,0,0
62 0113 0000000000 DW      0,0,0,0,0,0,0,0
63 0123 0000000000 DW      0,0,0,0,0,0,0,0
64 0133 0000000000 DW      0,0,0,0,0,0,0,0
65 0143 0000000000 DW      0,0,0,0,0
66 014D 000000      DB      0,0,0
67 0150 434F505952 DB      'COPYRIGHT 1982, '
68 0160 4449474954 DB      'DIGITAL RESEARCH'
69 0170 3135313238 DB      '151282'
70 0176 00000000      DB      0,0,0,0
71 017A 3635343332 DB      '654321'
72 ;
73 ; TRANSLATE TABLE-SECTOR NUMBERS ARE TRANSLATED HERE TO DECREASE
74 ; THE SYSTEM TIE FOR MISSED SECTORS WHEN SLOW CONTROLLERS ARE
75 ; INVOLVED. TRANSLATE TAKES PLACE ACCORDING TO THE 'SKEW' FACTOR
76 ; SET ABOVE.
77 ;
78 0180 02      OST:   DB      NTRKS      ;OPERATING SYSTEM TRACKS
79 0181 1A      SPT:   DB      NSECTS     ;SECTORS PER TRACK
80      TRAN:
81 0001 #      TRELT  SET      1
82 0001 #      TRBASE SET      1
83      REPT      NSECTS
84      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
85      TRELT  SET      TRELT+SKEW
86      IF      TRELT GT NSECTS
87      TRBASE SET      TRBASE+1
88      TRELT  SET      TRBASE
89      ENDIF
90      ENDM
91 0182+01      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
92 0183+03      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
93 0184+05      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
94 0185+07      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
95 0186+09      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
96 0187+0B      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
97 0188+0D      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
98 0189+0F      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
99 018A+11      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
100 018B+13      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
101 018C+15      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
102 018D+17      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
103 018E+19      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
104 018F+02      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
105 0190+04      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
106 0191+06      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
107 0192+08      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
108 0193+0A      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
109 0194+0C      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
110 0195+0E      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
111 0196+10      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR
112 0197+12      DB      TRELT      ;GENERATE FIRST/NEXT SECTOR

```

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113 0198+14      DB      TREL      ;GENERATE FIRST/NEXT SECTOR
114 0199+16      DB      TREL      ;GENERATE FIRST/NEXT SECTOR
115 019A+18      DB      TREL      ;GENERATE FIRST/NEXT SECTOR
116 019B+1A      DB      TREL      ;GENERATE FIRST/NEXT SECTOR

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117      ;
118      ; NOW LEAVE SPACE FOR EXTENSIONS TO TRANSLATE TABLE
119      ;

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```

120      IF      NSECTS LT 64
121      REPT     64-NSECTS
122      DB
123      ENDM

```

```

124 019C+00      DB      0
125 019D+00      DB      0
126 019E+00      DB      0
127 019F+00      DB      0
128 01A0+00      DB      0
129 01A1+00      DB      0
130 01A2+00      DB      0
131 01A3+00      DB      0
132 01A4+00      DB      0
133 01A5+00      DB      0
134 01A6+00      DB      0
135 01A7+00      DB      0
136 01A8+00      DB      0
137 01A9+00      DB      0
138 01AA+00      DB      0
139 01AB+00      DB      0
140 01AC+00      DB      0
141 01AD+00      DB      0
142 01AE+00      DB      0
143 01AF+00      DB      0
144 01B0+00      DB      0
145 01B1+00      DB      0
146 01B2+00      DB      0
147 01B3+00      DB      0
148 01B4+00      DB      0
149 01B5+00      DB      0
150 01B6+00      DB      0
151 01B7+00      DB      0
152 01B8+00      DB      0
153 01B9+00      DB      0
154 01BA+00      DB      0
155 01BB+00      DB      0
156 01BC+00      DB      0
157 01BD+00      DB      0
158 01BE+00      DB      0
159 01BF+00      DB      0
160 01C0+00      DB      0
161 01C1+00      DB      0

```

```

162      ENDIF

```

```

163      ;
164      ; UTILITY SUBROUTINES
165      ;

```

```

166      MLTBY3:
167      ;MULTIPLY THE CONTENTS OF REG E TO GET JMP ADDRESS
168 01C2 7B      MOV      A,E      ;ACC = E

```

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```

169 01C3 D601      SUI    1
170 01C5 5F        MOV    E,A      ;GET READY FOR MULTIPLY
171 01C6 83        ADD    E
172 01C7 83        ADD    E
173 01C8 5F        MOV    E,A
174 01C9 C9        RET              ;BACK AT IT
175                ;
176                SEL:
177 01CA 323706      STA    TEMP
178 01CD 3A3606      LDA    V3FLG
179 01D0 FEFF        CPI    TRUE
180 01D2 3A3706      LDA    TEMP
181 01D5 C2EE01      JNZ    SEL2
182                ;
183 01D8 32E805      STA    CREG      ;CREG = SELECTED REGISTER
184 01DB 210000      LXI    H,0000H
185 01DE 22EA05      SHLD   EREG      ;FOR FIRST TIME
186
187 01E1 3E09        MVI    A,SELDSK
188 01E3 32E605      STA    BIOSFC    ;STORE IT IN FUNC SPACE
189 01E6 0E32        MVI    C,DRBIOS
190 01E8 11E605      LXI    D,BIOSPB
191 01EB C30500      JMP     BDOS
192                SEL2:
193 01EE 4F          MOV     C,A
194 01EF 2A0100      LHLD   WBOOT
195 01F2 110900      LXI    D,SELDSK
196 01F5 CDC201      CALL   MLTBY3
197 01F8 19          DAD    D
198 01F9 E9          PCHL
199                ;
200                TRK:
201                ; SET UP TRACK
202 01FA 323706      STA    TEMP
203 01FD 3A3606      LDA    V3FLG
204 0200 FEFF        CPI    TRUE
205 0202 3A3706      LDA    TEMP
206 0205 C21E02      JNZ    TRK2
207
208                ;
209 0208 3E00        MVI    A,00H
210 020A 32E905      STA    BREG      ;ZERO OUT B REGISTER
211 020D 79          MOV     A,C      ;ACC = TRACK #
212 020E 32E805      STA    CREG      ;SET UP PB
213 0211 3E0A        MVI    A,SETTRK  ;SETTRK FUNC #
214 0213 32E605      STA    BIOSFC
215 0216 0E32        MVI    C,DRBIOS
216 0218 11E605      LXI    D,BIOSPB
217 021B C30500      JMP     BDOS
218                TRK2:
219 021E 2A0100      LHLD   WBOOT
220 0221 110A00      LXI    D,SETTRK
221 0224 CDC201      CALL   MLTBY3
222 0227 19          DAD    D
223 0228 E9          PCHL      ;GONE TO SET TRACK
224                ;

```

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```

225      SEC:
226      ; SET UP SECTOR NUMBER
227 0229 323706      STA      TEMP
228 022C 3A3606      LDA      V3FLG
229 022F FEFF        CPI      TRUE
230 0231 3A3706      LDA      TEMP
231 0234 C24D02      JNZ      SEC2
232      ;
233 0237 3E00        MVI      A,00H
234 0239 32E905      STA      BREG      ;ZERO OUT BREG
235 023C 79          MOV      A,C      ; ACC = C
236 023D 32E805      STA      CREG      ;CREG = SECTOR #
237 0240 3E0B        MVI      A,SETSEC
238 0242 32E605      STA      BIOSFC      ;SET UP BIOS CALL
239 0245 0E32        MVI      C,DRBIOS
240 0247 11E605      LXI      D,BIOSPB
241 024A C30500      JMP      BDOS
242      SEC2:
243 024D 2A0100      LHLD     WBOOT
244 0250 110B00      LXI      D,SETSEC
245 0253 CDC201      CALL     MLTBY3
246 0256 19          DAD      D
247 0257 E9          PCHL
248      ;
249      DMA:
250      ; SET DMA ADDRESS TO VALUE OF BC
251 025B 323706      STA      TEMP
252 025B 3A3606      LDA      V3FLG
253 025E FEFF        CPI      TRUE
254 0260 3A3706      LDA      TEMP
255 0263 C27B02      JNZ      DMA2
256      ;
257 0266 78          MOV      A,B      ;
258 0267 32E905      STA      BREG      ;
259 026A 79          MOV      A,C      ;SET UP THE BC
260 026B 32E805      STA      CREG      ;REGISTER PAIR
261 026E 3E0C        MVI      A,SETDMA      ;
262 0270 32E605      STA      BIOSFC      ;SET UP BIOS #
263 0273 0E32        MVI      C,DRBIOS
264 0275 11E605      LXI      D,BIOSPB
265 027B C30500      JMP      BDOS
266      DMA2:
267 027B 2A0100      LHLD     WBOOT
268 027E 110C00      LXI      D,SETDMA
269 0281 CDC201      CALL     MLTBY3
270 0284 19          DAD      D
271 0285 E9          PCHL
272      ;
273      READ:
274      ; PERFORM READ OPERATION
275 0286 323706      STA      TEMP
276 0289 3A3606      LDA      V3FLG
277 028C FEFF        CPI      TRUE
278 028E 3A3706      LDA      TEMP
279 0291 C2A102      JNZ      READ2
280      ;

```

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```

281 0294 3E0D      MVI    A,READF
282 0296 32E605    STA    BIOSFC
283 0299 0E32      MVI    C,DRBIOS
284 029B 11E605    LXI    D,BIOSPB
285 029E C30500    JMP     BDOS
286
287 02A1 2A0100    READ2:  LHLD   WBOOT
288 02A4 110D00    LXI     D,READF
289 02A7 CDC201    CALL    MLTBY3
290 02AA 19        DAD     D
291 02AB E9        PCHL
292
293
294
295 02AC 323706    WRITE:  STA    TEMP
296 02AF 3A3606    ; PERFORM WRITE OPERATION
297 02B2 FEFF      LDA    V3FLG
298 02B4 3A3706    CPI    TRUE
299 02B7 C2C702    LDA    TEMP
300
301 02BA 3E0E      JNZ    WRITE2
302 02BC 32E605    MVI    A,WRITF
303 02BF 0E32      STA    BIOSFC
304 02C1 11E605    MVI    C,DRBIOS
305 02C4 C30500    LXI    D,BIOSPB
306
307 02C7 2A0100    JMP     BDOS
308 02CA 110E00    WRITE2: LHLD   WBOOT
309 02CD CDC201    LXI     D,WRITF
310 02D0 19        CALL    MLTBY3
311 02D1 E9        DAD     D
312
313
314
315 02D2 6F        PCHL
316 02D3 2600      ;
317
318
319
320 02D5+29        MULTSEC:
321 02D6+29        ; MULTIPLY THE SECTOR # IN RA BY THE SECTOR SIZE
322 02D7+29        MOV     L,A
323 02D8+29        MVI     H,0
324 02D9+29        ;SECTOR IN HL
325 02DA+29        REPT    LOG2SEC
326 02DB+29        DAD     H
327 02DC C9        ENDM
328
329
330
331 02DD 0E01      DAD     H
332 02DF CD0500    DAD     H
333
334 02E2 FE61      DAD     H
335 02E4 D8        DAD     H
336 02E5 FE7B      DAD     H
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SER. #

;SET UP BIOS #

;WITH HL - SECTOR\*SECTORSIZE

```

337 02E7 D0          RNC
338 02E8 E65F        ANI      05FH
339 02EA C9          RET
340                  ;
341                  PUTCHAR;
342                  ; WRITE CHARACTER FROM RA TO CONSOLE
343 02EB 5F          MOV      E,A
344 02EC 0E02        MVI      C,CONO
345 02EE CD0500      CALL     BDOS
346 02F1 C9          RET
347                  ;
348                  CRLF;
349                  ; SEND CARRIAGE RETURN, LINE FEED
350 02F2 3E0D        MVI      A,CR
351 02F4 CDEB02      CALL     PUTCHAR
352 02F7 3E0A        MVI      A,LF
353 02F9 CDEB02      CALL     PUTCHAR
354 02FC C9          RET
355                  ;
356
357                  CRMSG;
358                  ; PRINT MESSAGE ADDRESSED BY THE HL UNTIL ZERO WITH LEADING CRLF
359 02FD D5          PUSH     D
360 02FE CDF202      CALL     CRLF
361 0301 D1          POP      D
362                  ;DROP THROUGH TO OUTMSG
363 0302 0E09        MVI      C,9
364 0304 C30500      JMP      BDOS
365                  ;
366                  SELECT;
367                  ; SELECT DISK GIVEN BY RA
368 0307 0E0E        MVI      C,0EH
369 0309 C30500      JMP      BDOS
370                  ;
371                  DWRITE;
372                  ; WRITE FOR FILE COPY
373 030C 0E15        MVI      C,DWRITEF
374 030E C30500      JMP      BDOS
375                  ;
376                  DREAD;
377                  ; DISK READ FUNCTION
378 0311 0E14        MVI      C,DREADF
379 0313 C30500      JMP      BDOS
380                  ;
381                  OPEN;
382                  ; FILE OPEN FUNCTION
383 0316 0E0F        MVI      C,OPENF
384 0318 C30500      JMP      BDOS
385                  ;
386                  CLOSE;
387 031B 0E10        MVI      C,CLOSEF
388 031D C30500      JMP      BDOS
389                  ;
390                  MAKE;
391 0320 0E16        MVI      C,MAKEF
392 0322 C30500      JMP      BDOS

```

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```

393      ;
394      DELETE:
395      0325 0E13      MVI    C,DELTEF
396      0327 C30500    JMP     BDOS
397      ;
398      ;
399      ;
400      DSTDMA:
401      032A 0E1A      MVI    C,26
402      032C C30500    JMP     BDOS
403      ;
404      SOURCE:
405      032F 116006    LXI     D,GETPRM      ;ASK USER FOR SOURCE DRIVE
406      0332 CDFD02    CALL    CRMSG
407      0335 CDDD02    CALL    GETCHAR      ;OBTAIN RESPONSE
408      0338 FE0D      CPI     CR           ;IS IT CR?
409      033A CA5D03    JZ      DFLTDR      ;SKIP IF CR ONLY
410      033D FE03      CPI     CTLC        ;ISIT ^C?
411      033F CAD405    JZ      REBOOT
412      ;
413      0342 D641      SUI     'A'          ;NORMALIZE DRIVE #
414      0344 FE04      CPI     NDISKS      ;VALID DRIVE?
415      0346 DA4F03    JC      GETC        ;SKIP TO GETC IF SO
416      ;
417      ; INVALID DRIVE
418      0349 CDDF05    CALL    BADDISK      ;TELL USER BAD DRIVE
419      034C C32F03    JMP     SOURCE      ;TRY AGAIN
420      ;
421      GETC:
422      ; SELECT DISK GIVEN BY ACC.
423      034F C641      ADI     'A'
424      0351 329506    STA     GDISK      ;STORE SOURCE DISK
425      0354 D641      SUI     'A'
426      0356 5F      MOV     E,A          ;MOVE DISK INTO E FOR SELECT FUNC
427      0357 CDA01    CALL    SEL          ;SELECT THE DISK
428      035A C37303    JMP     GETVER
429      ;
430      DFLTDR:
431      035D 0E19      MVI     C,25        ;FUNC 25 FOR CURRENT DISK
432      035F CD0500    CALL    BDOS        ;GET CURDSK
433      0362 C641      ADI     'A'
434      0364 329506    STA     GDISK
435      0367 CDF202    CALL    CRLF
436      036A 118B06    LXI     D,VERGET
437      036D CD0203    CALL    OUTMSG
438      0370 C37C03    JMP     VERCRCR
439      ;
440      GETVER:
441      ; GETSYS SET R/W TO READ AND GET THE SYSTEM
442      0373 CDF202    CALL    CRLF
443      0376 118B06    LXI     D,VERGET      ;VERIFY SOURCE DISK
444      0379 CD0203    CALL    OUTMSG
445      037C CDDD02    VERCRCR: CALL    GETCHAR
446      037F FE0D      CPI     CR
447      0381 C2D405    JNZ     REBOOT      ;JMP ONLY IF NOT VERIFIED
448      0384 CDF202    CALL    CRLF

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449 0387 C9          RET
450                  ;
451                  DESTIN:
452 0388 11A906        LXI    D,PUTPRM    ;ADDRESS OF MESSAGE
453 0388 CDFD02        CALL   CRMSG      ;PRINT IT
454 038E CDD02         CALL   GETCHAR    ;GET ANSWER
455 0391 FE0D          CPI    CR
456 0393 CAD405        JZ     REBOOT      ;ALL DONE
457 0396 D641          SUI    'A'
458 0398 FE04          CPI    NDISKS      ;VALID DISK
459 039A DAA303        JC     PUTC
460                  ;
461                  ; INVALID DRIVE
462 039D CDDF05        CALL   BADDISK     ;TELL USER BAD DRIVE
463 03A0 C3C204        JMP    PUTSYS     ;TO TRY AGAIN
464                  ;
465                  PUTC:
466                  ; SET DISK FROM RA
467 03A3 C641          ADI    'A'
468 03A5 32E606        STA    PDISK      ;MESSAGE SENT
469 03A8 D641          SUI    'A'
470 03AA 5F            MOV    E,A         ;DISK # IN E
471 03AB CDCA01        CALL   SEL         ;SELECT DESTINATION DRIVE
472                  ; PUT SYSTEM, SET R/W TO WRITE
473 03AE 11D706        LXI    D,VERPUT    ;VERIFY DEST PRMPT
474 03B1 CDFD02        CALL   CRMSG      ;PRINT IT OUT
475 03B4 CDD02         CALL   GETCHAR    ;RETRIEVE ANSWER
476 03B7 FE0D          CPI    CR
477 03B9 C2D405        JNZ    REBOOT      ;EXIT TO SYSTEM IF ERROR
478 03BC CDF202        CALL   CRLF
479 03BF C9           RET
480                  ;
481                  ;
482                  GETPUT:
483                  ; GET OR PUT CP/M (RW = 0 FOR READ, 1 FOR WRITE)
484                  ; DISK IS ALREADY SELECTED
485 03C0 210010        LXI    H,LOADP     ;LOAD POINT IN RAM FOR DMA ADDRESS
486 03C3 224006        SHLD   DMADDR
487                  ;
488                  ;
489                  ;
490                  ;
491                  ;
492                  ; CLEAR TRACK 00
493 03C6 3EFF          MVI    A,-1
494 03C8 323C06        STA    TRACK
495                  ;
496                  RWTRK:
497                  ; READ OR WRITE NEXT TRACK
498 03CB 213C06        LXI    H,TRACK
499 03CE 34            INR    M           ;TRACK = TRACK+1
500 03CF 3A8001        LDA    OST         ;# OF OS TRACKS
501 03D2 BE            CMP    M           ;=TRACK # ?
502 03D3 CA5604        JZ     ENDRW      ;END OF READ/WRITE
503                  ;
504                  ; OTHERWISE NOT DONE

```

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505 03D6 4E      MOV    C,M      ;TRACK NUMBER
506 03D7 CDF001  CALL    TRK      ;SET TO TRACK
507 03DA 3EFF     MVI    A,-1     ;COUNTS 0,1,2,...,25
508 03DC 323E06   STA    SECTOR
509             ;
510             RWSEC:
511             ; READ OR WRITE A SECTOR
512 03DF 3A8101    LDA    SPT      ;SECTORS PER TRACK
513 03E2 213E06    LXI    H,SECTOR
514 03E5 34       INR    M      ;SET TO NEXT SECTOR
515 03E6 BE       CMP    M      ;A=26 AND M=0,1,...,25
516 03E7 CA4504   JZ     ENDTRK
517             ;
518             ; READ OR WRITE SECTOR TO OR FROM CURRENT DMA ADDRESS
519 03EA 213E06    LXI    H,SECTOR
520 03ED 5E       MOV    E,M      ;SECTOR NUMBER
521 03EE 1600     MVI    D,0      ;TO DE
522 03F0 218201    LXI    H,TRAN
523 03F3 46       MOV    B,M      ;TRAN(0) IN B
524 03F4 19       DAD    D      ;SECTOR TRANSLATED
525 03F5 4E       MOV    C,M      ;VALUE TO C READY FOR SELECT
526 03F6 C5       PUSH   B      ;SAVE TRAN(0)
527 03F7 CD2902   CALL    SEC
528 03FA C1       POP    B      ;RECALL TRAN(0),TRAN(SECTOR)
529 03FB 79       MOV    A,C      ;TRAN(SECTOR)
530 03FC 90       SUB    B      ;--TRAN(SECTOR)
531 03FD CD0202   CALL    MULTSEC ;*SECTOR SIZE
532 0400 EB       XCHG      ;TO DE
533 0401 2A4006   LHLD    DMADDR ;BASE DMA
534 0404 19       DAD    D
535 0405 44       MOV    B,H
536 0406 4D       MOV    C,L      ;TO SET BC FOR SEC CALL
537 0407 CD5802   CALL    DMA      ;DMA ADDRESS SET FROM BC
538 040A AF       XRA    A
539 040B 324206   STA    RETRY     ;TO SET ZERO RETRIES
540             ;
541             TRYSEC:
542             ; TRY TO READ OR WRITE CURRENT SECTOR
543 040E 3A4206    LDA    RETRY
544 0411 FE01     CPI    MAXTRY
545 0413 DA2A04    JC     TRYOK
546             ;
547             ; PAST MAXTRY, MESSAGE AND IGNORE
548 0416 11C507    LXI    D,ERRMSG
549 0419 CD0203    CALL    OUTMSG
550 041C CDD002    CALL    GETCHAR
551 041F FE0D     CPI    CR
552 0421 C2D405    JNZ    REBOOT
553             ;
554             ; TYPED A CR, OK TO IGNORE
555 0424 CDF202    CALL    CRLF
556 0427 C3DF03    JMP    RWSEC
557             ;
558             TRYOK:
559             ; OK TO TYR READ WRITE
560 042A 3C       INR    A

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561 042B 324206 STA RETRY
562 042E 3A3F06 LDA RW
563 0431 B7 ORA A
564 0432 CA3B04 JZ TRYREAD
565 ;
566 ; MUST BE WRITE
567 0435 CDAC02 CALL WRITE
568 0438 C33E04 JMP CHKRW
569 TRYREAD:
570 043B CD8602 CALL READ
571 CHKRW:
572 043E B7 ORA A
573 043F CADF03 JZ RWSEC ;ZERO FLAG IF READ/WRITE OK
574 ;
575 ;ERROR, RETRY OPERATION
576 0442 C30E04 JMP TRYSEC
577 ;
578 ; END OF TRACK
579 ENDRK:
580 0445 3A8101 LDA SPT ;SECTORS PER TRACK
581 0448 CDD202 CALL MULTSEC ;*SECSIZE
582 044B EB XCHG ; TO DE
583 044C 2A4006 LHLD DMAHDR ;BASE DMA FOR THIS TRACK
584 044F 19 DAD D ;+SPT*SECSIZE
585 0450 224006 SHLD DMAHDR ;READY FOR NEXT TRACK
586 0453 C3CB03 JMP RWTRK ;FOR ANOTHER TRACK
587 ;
588 ENDRW:
589 ; END OF READ OR WRITE
590 0456 C9 RET
591 ;
592 ;*****
593 ;*
594 ;* MAIN ROUTINE
595 ;*
596 ;*
597 ;*****
598 ;
599 START:
600
601 0457 316908 LXI SP,STACK
602 045A 114306 LXI D,SIGNON
603 045D CD0203 CALL OUTMSG
604 ;
605 ;GET VERSION NUMBER TO CHECK COMPATABILITY
606 0460 0E0C MVI C,12 ;VERSION CHECK
607 0462 CD0500 CALL BDOS
608 0465 7D MOV A,L ;VERSION IN ACC
609 0466 FE30 CPI 30H ;VERSION 3 OR NEWER?
610 0468 DA7304 JC OLDRVR ;
611 046B 3EFF MVI A,TRUE
612 046D 323606 STA V3FLG ;
613 0470 C37B04 JMP FCBCHK
614 OLDRVR:
615 0473 3E00 MVI A,FALSE
616 0475 323606 STA V3FLG

```

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```

617      ;
618
619      ; CHECK FOR DEFAULT FILE LIAD INSTEAD OF GET
620 0478 3A5D00 FCBCHK: LDA FCB+1 ;BLANK IF NO FILE
621 047B FE20 CPI ' '
622 047D CAB204 JZ GETSYS ;SKIP TO SYSTEM MESSAGE
623 0480 115C00 LXI D,FCB ;TRY TO OPEN IT
624 0483 CD1603 CALL OPEN
625 0486 3C INR A ;255 BECOMES 00
626 0487 C29304 JNZ R00K
627      ;
628      ; FILE NOT PRESENT
629 048A 115907 LXI D,NOFILE
630 048D CDFD02 CALL CRMSG
631 0490 C3D405 JMP REBOOT
632      ;
633      ;FILE PRESENT
634 R00K:
635 0493 AF XRA A
636 0494 327C00 STA FCBCR ;CURRENT RECORD = 0
637 0497 210010 LXI H,LOADP
638      RDINP:
639 049A E5 PUSH H
640 049B 44 MOV B,H
641 049C 4D MOV C,L
642 049D CD5802 CALL DMA ;DMA ADDRESS SET
643 04A0 115C00 LXI D,FCB ;READY FR READ
644 04A3 CD1103 CALL DREAD
645 04A6 E1 POP H ;RECALL
646 04A7 B7 ORA A ;00 IF READ OK
647 04A8 C2C204 JNZ PUTSYS ;ASSUME EOF IF NOT
648      ; MORE TO READ CONTINUE
649 04AB 118000 LXI D,SECSIZ
650 04AE 19 DAD D ;HL IS NEW LOAD ADDRESS
651 04AF C39A04 JMP RDINP
652      ;
653      GETSYS:
654 04B2 CD2F03 CALL SOURCE ;FIND OUT SOURCE DRIVE
655      ;
656 04B5 AF XRA A ;ZERO OUT A
657 04B6 323F06 STA RW ;RW = 0 TO SIGNIFY READ
658 04B9 CDC003 CALL GETPUT ;GET OR READ SYSTEM
659 04BC 111907 LXI D,DONE ;END MESSAGE OF GET OR READ FUNC
660 04BF CD0203 CALL OUTMSG ;PRINT IT OUT
661      ;
662      ; PUT THE SYSTEM
663      PUTSYS:
664 04C2 CD8803 CALL DESTIN ;GET DEST DRIVE
665      ;
666 04C5 213F06 LXI H,RW ;LOAD ADDRESS
667 04C8 3601 MVI M,1
668 04CA CDC003 CALL GETPUT ;TO PUT SYSTEM BACK ON DISK
669 04CD 111907 LXI D,DONE
670 04D0 CD0203 CALL OUTMSG ;PRINT OUT END PROMPT
671      ;
672      ; FILE COPY FOR CPM.SYS

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```

673      ;
674      CPYCPM:
675      ; PROMPT THE USER FOR THE SOURCE OF CP/M3.SYS
676      ;
677      04D3 11FA06      LXI      D,CPYMSG      ;PRINT COPYS PROMPT
678      04D6 CDFD02      CALL     CRMSG      ;PRINT IT
679      04D9 CDD002      CALL     GETCHAR     ;OBTAIN REPLY
680      04DC FE59         CPI      Y          ;IS IT YES?
681      04DE C2D405      JNZ      REROOT      ;IF NOT EXIT
682                                     ;ELSE
683      ;
684      ;
685      04E1 0E0D         MVI      C,13       ;FUNC # FOR RESET
686      04E3 CD0500      CALL     BDOS      ;
687      04E6 3C          INR      A
688
689      04E7 11C507      LXI      D,ERRMSG
690      04EA CCD105      CZ       FINIS
691      ;
692      04ED CD2F03      CALL     SOURCE      ;GET SOURCE DISK FOR CPM3.SYS
693      CNTNUE:
694      04F0 3A9506      LDA      GDISK      ;ACC = SOURCE DISK
695      04F3 D641        SUI      'A'
696      04F5 1600        MVI      D,00H
697      04F7 5F          MOV      E,A        ;DE = SELECTED DISK
698      04FB CD0703      CALL     SELCT
699      ; NOW COPY THE FCBS
700      04FB 0E24        MVI      C,36       ;FOR COPY
701      04FD 11EE05      LXI      D,SFCB     ;SOURCE FILE
702      0500 211206      LXI      H,DFCB     ;DESTINATION FILE
703      MFCB:
704
705      0503 1A          LDAX     D
706      0504 13          INX      D          ;READY NEXT
707      0505 77          MOV      M,A
708      0506 23          INX      H          ;READY NEXT DEST
709      0507 0D          DCR      C          ;DECREMENT COUN
710      0508 C20305      JNZ      MFCB
711      ;
712      050B 3A9506      LDA      GDISK      ;ACC = SOURCE DISK
713      050E D640        SUI      40H        ;CORRECT DISK
714      0510 21EE05      LXI      H,SFCB
715      0513 77          MOV      M,A        ;SFCB HAS SOURCE DISK #
716      0514 3AE606      LDA      PDISK     ;GET THE DEST. DISK
717      0517 211206      LXI      H,DFCB
718      051A D640        SUI      040H      ;NORMALIZE DISK
719      051C 77          MOV      M,A
720      ;
721      051D AF          XRA      A          ;ZERO OUT A
722      051E 323206      STA      DFCBCR     ;CURRENT REC = 0
723      ;
724      ; SOURCE AND DESTINATION FCB'S READY
725      ;
726      0521 11EE05      LXI      D,SFCB
727      0524 CD1603      CALL     OPEN      ;OPEN THE FILE
728      0527 115907      LXI      D,NOFILE  ;ERROR MESSG

```

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729 052A 3C      INR    A      ;255 BECOMES 0
730 052B CCD105  CZ     FINIS   ;DONE IF NO FILE
731              ;
732              ; SOURCE FILE IS PRESENT AND OPEN
733 052E 110010  LXI    D,LOADP ;GET DMA ADDRESS
734 0531 EB      XCHG          ;MOVE ADDRESS TO HL REGS
735 0532 223906  SHLD    BEGIN   ;SAVE FOR BEGIN OF WRITE
736              ;
737 0535 3A3906  LDA     BEGIN   ;GET LOW BYTE OF
738 0538 6F      MOV     L,A     ;DMA ADDRESS INTO L
739 0539 3A3A06  LDA     BEGIN+1 ;
740 053C 67      MOV     H,A     ;INTO H ALSO
741              COPY1:
742 053D EB      XCHG          ;DE = ADDRESS OF DMA
743 053E CD2A03  CALL    DSTDMA  ;
744              ;
745 0541 11EE05  LXI     D,SFCB   ;
746 0544 CD1103  CALL    DREAD   ;READ NEXT RECORD
747 0547 B7      ORA     A       ;END OF FILE?
748 0548 C26405  JNZ     EOF     ;SKIP WRITE IF SO
749              ;
750 054B 3A3D06  LDA     CRNREC
751 054E 3C      INR     A       ;BUMP IT
752 054F 323D06  STA     CRNREC
753              ;
754 0552 3A3906  LDA     BEGIN
755 0555 6F      MOV     L,A
756 0556 3A3A06  LDA     BEGIN+1
757 0559 67      MOV     H,A
758 055A 118000  LXI     D,EIGHTY
759 055D 19      DAD     D       ;ADD EIGHTY TO BEGIN ADDRESS
760 055E 223906  SHLD    BEGIN
761 0561 C33D05  JMP     COPY1   ;LOOP UNTIL EOF
762              ;
763              EOF:
764 0564 111907  LXI     D,DONE
765 0567 CD0203  CALL    OUTMSG
766              ;
767              COPY2:
768 056A CD8B03  CALL    DESTIN   ;GET DESTINATION DRIVE FOR CPM3.SYS
769 056D 111206  LXI     D,DFCB   ;SET UP DEST FCB
770 0570 EB      XCHG
771 0571 3AE606  LDA     PDISK
772 0574 D640    SUI     040H    ;NORMALIZE DISK
773 0576 77      MOV     H,A     ;CORRECT DISK FOR DEST
774 0577 EB      XCHG          ;DE = DFCB
775 0578 CD2503  CALL    DELETE  ;DELETE FILE IF THERE
776              ;
777 057B 111206  LXI     D,DFCB   ;
778 057E CD2003  CALL    MAKE    ;MAKE A NEW ONE
779 0581 117807  LXI     D,NODIR
780 0584 3C      INR     A       ;CHECK DIRECTORY SPACE
781 0585 CCD105  CZ     FINIS   ;END IF NONE
782              ;
783 0588 110010  LXI     D,LOADP
784 058B EB      XCHG

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785 058C 223906      SHLD  BEGIN
786                  ;
787 058F 3A3906      LDA   BEGIN
788 0592 6F          MOV   L,A
789 0593 3A3A06      LDA   BEGIN+1
790 0596 67          MOV   H,A
791                  LOOP2:
792 0597 EB          XCHG
793 0598 CD2A03      CALL  DSTDMA
794 059B 111206      LXI   D,DFCB
795 059E CD0C03      CALL  DWRITE
796 05A1 119307      LXI   D,FSPACE
797 05A4 B7          ORA   A
798 05A5 C4D105      CNZ   FINIS
799 05AB 3A3D06      LDA   CRNREC
800 05AB 3D          DCR   A
801 05AC 323D06      STA   CRNREC
802 05AF FE00        CPI   0
803 05B1 CAC605      JZ    FNLMSG
804 05B4 3A3906      LDA   BEGIN
805 05B7 6F          MOV   L,A
806 05B8 3A3A06      LDA   BEGIN+1
807 05BB 67          MOV   H,A
808 05BC 118000      LXI   D,EIGHTY
809 05BF 19          DAD   D
810 05C0 223906      SHLD  BEGIN
811 05C3 C39705      JMP   LOOP2
812                  ; COPY OPERATION COMPLETE
813                  FNLMSG:
814 05C6 111206      LXI   D,DFCB
815 05C9 0E10        MVI   C,CLOSEF
816 05CB CD0500      CALL  BDOS
817                  ;
818 05CE 111907      LXI   D,DONE
819                  ;
820                  FINIS:
821                  ; WRITE MESSAGE GIVEN BY DE, REBOOT
822 05D1 CD0203      CALL  OUTMSG
823                  ;
824                  REBOOT:
825 05D4 0E0D        MVI   C,13
826 05D6 CD0500      CALL  BDOS
827 05D9 CDF202      CALL  CRLF
828 05DC C30000      JMP   BOOT
829                  ;
830                  BADDISK:
831 05DF 112B07      LXI   D,BDISK
832 05E2 CDFD02      CALL  CRMSG
833 05E5 C9          RET
834                  ;*****
835                  ;*
836                  ;*
837                  ;*   DATA STRUCTURES
838                  ;*
839                  ;*
840                  ;*****

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```

841      ;
842      BIOSPB:
843      ; BIOS PARAMETER BLOCK
844      05E6 00      BIOSFC:      DB      0      ;BIOS FUNCTION NUMBER
845      05E7 00      AREG: DB      0      ;A REGISTER CONTENTS
846      05E8 00      CREG: DB      0      ;C REGISTER CONTENTS
847      05E9 00      BREG: DB      0      ;B REGISTER CONTENTS
848      05EA 00      EREG: DB      0      ;E REGISTER CONTENTS
849      05EB 00      DREG: DB      0      ;D REGISTER CONTENTS
850      05EC 0000    HLREG: DW      0      ;H REGISTER CONTENTS
851      ;
852      SFCB:
853      05EE      DR: DS      1
854      05EF 43504D3320F1F8: DB      'CPM3'
855      05F7 535953    TIT3: DB      'SYS'
856      05FA 00      EXT: DB      0
857      05FB 00      CS: DB      0
858      05FC 00      RS: DB      0
859      05FD 00      RCC: DB      0
860      05FE      DOD15: DS      16
861      060E 00      CCR: DB      0
862      060F      ROR2: DS      3
863      ;
864      0612      DFCB: DS      36
865      0632 =      DFCBCR EQU      DFCB+32
866      ;
867      ;
868      0636 00      V3FLG: DB      0      ;FLAG FOR VERSION #
869      0637 00      TEMP: DB      0
870      0638      SDISK: DS      1      ;SELECTED DISK
871      0639 0000    BEGIN: DW      0
872      063B 00      DFLAG: DB      0
873      063C      TRACK: DS      1      ;CURRENT TRACK
874      063D 00      CRNREC: DB      0      ;CURRENT REC COUNT
875      063E      SECTOR: DS      1      ;CURRENT SECTOR
876      063F      RW: DS      1      ;READ IF 0 WRITE IF 1
877      0640      DMADDR: DS      2      ;CURRENT DMA ADDRESS
878      0642      RETRY: DS      1      ;NUMBER OF TRIES ON THIS SECTOR
879      0643 43502F4D20SIGNON: DB      'CP/M 3 COPYSYS - Version '
880      065C 332E30      DB      'VERS/10+'0','.',',VERS MOD 10 +'0'
881      065F 24      DB      '$'
882      0660 536F757263GETPRM: DB      'Source drive name (or return for default) $'
883      068B 536F757263VERGET: DB      'Source on '
884      0695      GDISK: DS      1
885      0696 207468656E      DB      ' then type return $'
886      06A9 4465737469PUTPRM: DB      'Destination drive name (or return to reboot) $'
887      06D7 4465737469VERPUT: DB      'Destination on '
888      06E6      PDISK: DS      1
889      06E7 207468656E      DB      ' then type return $'
890      06FA 446F20796FCPYMSG: DB      'Do you wish to copy CPM3.SYS? $'
891      0719 46756E6374DONE: DB      'Function complete$'
892      ;
893      ; ERROR MESSAGES.....
894      ;
895      072B 4552524F52QDISK: DB      'ERROR: Invalid drive name (Use A, B, C, or D)$'
896      0759 4552524F52NOFILE: DB      'ERROR: No source file on disk.$'

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```
897 0778 4552524F52NODIR: DB 'ERROR: No directory space.$'
898 0793 4552524F52FSPACE: DB 'ERROR: Out of data space.$'
899 07AD 4552524F52WRPROT: DB 'ERROR: Write protected?$$'
900 07C5 4552524F52ERRMSG: DB 'ERROR: Possible incompatible disk format.'
901 07EE 0D0A205479 DB CR,LF,' Type return to ignore.$'
902 0808 4552524F52CLSERR: DB 'ERROR: Close operation failed.$'
903 ;
904 0827 DS STACKSIZE * 3
905 STACK:
906 0869 END
```

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|         |      |      |      |      |      |      |     |      |     |     |     |
|---------|------|------|------|------|------|------|-----|------|-----|-----|-----|
| AREG    | 05E7 | 845# |      |      |      |      |     |      |     |     |     |
| BADDISK | 05DF | 418  | 462  | 830# |      |      |     |      |     |     |     |
| BDOS    | 0005 | 28#  | 191  | 217  | 241  | 265  | 285 | 305  | 332 | 345 | 364 |
|         |      | 369  | 374  | 379  | 384  | 388  | 392 | 396  | 402 | 432 | 607 |
|         |      | 686  | 816  | 826  |      |      |     |      |     |     |     |
| BEGIN   | 0639 | 735  | 737  | 739  | 754  | 756  | 760 | 785  | 787 | 789 | 804 |
|         |      | 806  | 810  | 871# |      |      |     |      |     |     |     |
| BIOSFC  | 05E6 | 188  | 214  | 238  | 262  | 282  | 302 | 844# |     |     |     |
| BIOSPB  | 05E6 | 190  | 216  | 240  | 264  | 284  | 304 | 842# |     |     |     |
| BOOT    | 0000 | 29#  | 828  |      |      |      |     |      |     |     |     |
| BREG    | 05E9 | 210  | 234  | 258  | 847# |      |     |      |     |     |     |
| CCR     | 060E | 861# |      |      |      |      |     |      |     |     |     |
| CHKRW   | 043E | 568  | 571# |      |      |      |     |      |     |     |     |
| CLOSE   | 031B | 386# |      |      |      |      |     |      |     |     |     |
| CLOSEF  | 0010 | 34#  | 387  | 815  |      |      |     |      |     |     |     |
| CLSERR  | 0808 | 902# |      |      |      |      |     |      |     |     |     |
| CNTNUE  | 04F0 | 693# |      |      |      |      |     |      |     |     |     |
| CONI    | 0001 | 30#  | 331  |      |      |      |     |      |     |     |     |
| CONO    | 0002 | 31#  | 344  |      |      |      |     |      |     |     |     |
| COPY1   | 053D | 741# | 761  |      |      |      |     |      |     |     |     |
| COPY2   | 056A | 767# |      |      |      |      |     |      |     |     |     |
| CPYCPH  | 04D3 | 674# |      |      |      |      |     |      |     |     |     |
| CPYMSG  | 06FA | 677  | 890# |      |      |      |     |      |     |     |     |
| CR      | 000D | 45#  | 350  | 408  | 446  | 455  | 476 | 551  | 901 |     |     |
| CREG    | 05E8 | 183  | 212  | 236  | 260  | 846# |     |      |     |     |     |
| CRLF    | 02F2 | 348# | 360  | 435  | 442  | 448  | 478 | 555  | 827 |     |     |
| CRMSG   | 02FD | 357# | 406  | 453  | 474  | 630  | 678 | 832  |     |     |     |
| CRNREC  | 063D | 750  | 752  | 799  | 801  | 874# |     |      |     |     |     |
| CS      | 05FB | 857# |      |      |      |      |     |      |     |     |     |
| CTLC    | 0003 | 41#  | 410  |      |      |      |     |      |     |     |     |
| D0D15   | 05FE | 860# |      |      |      |      |     |      |     |     |     |
| DELETE  | 0325 | 394# | 775  |      |      |      |     |      |     |     |     |
| DELTEF  | 0013 | 37#  | 395  |      |      |      |     |      |     |     |     |
| DESTIN  | 0388 | 451# | 664  | 768  |      |      |     |      |     |     |     |
| DFCB    | 0612 | 702  | 717  | 769  | 777  | 794  | 814 | 864# | 865 |     |     |
| DFCBCR  | 0632 | 722  | 865# |      |      |      |     |      |     |     |     |
| DFLAG   | 0638 | 872# |      |      |      |      |     |      |     |     |     |
| DFLTDR  | 035D | 409  | 430# |      |      |      |     |      |     |     |     |
| DMA     | 0258 | 249# | 537  | 642  |      |      |     |      |     |     |     |
| DMA2    | 027B | 255  | 266# |      |      |      |     |      |     |     |     |
| DMADDR  | 0640 | 486  | 533  | 583  | 585  | 877# |     |      |     |     |     |
| DONE    | 0719 | 659  | 669  | 764  | 818  | 891# |     |      |     |     |     |
| DR      | 05EE | 853# |      |      |      |      |     |      |     |     |     |
| DRBIOS  | 0032 | 39#  | 189  | 215  | 239  | 263  | 283 | 303  |     |     |     |
| DREAD   | 0311 | 376# | 644  | 746  |      |      |     |      |     |     |     |
| DREADF  | 0014 | 38#  | 378  |      |      |      |     |      |     |     |     |
| DREG    | 05EB | 849# |      |      |      |      |     |      |     |     |     |
| DSTDMA  | 032A | 400# | 743  | 793  |      |      |     |      |     |     |     |
| DWRITE  | 030C | 371# | 795  |      |      |      |     |      |     |     |     |
| DWRTF   | 0015 | 35#  | 373  |      |      |      |     |      |     |     |     |
| EIGHTY  | 0080 | 40#  | 758  | 808  |      |      |     |      |     |     |     |
| ENDRW   | 0456 | 502  | 588# |      |      |      |     |      |     |     |     |
| ENDTRK  | 0445 | 516  | 579# |      |      |      |     |      |     |     |     |
| EOF     | 0564 | 748  | 763# |      |      |      |     |      |     |     |     |
| EREG    | 05EA | 185  | 848# |      |      |      |     |      |     |     |     |
| ERRMSG  | 07C5 | 548  | 689  | 900# |      |      |     |      |     |     |     |

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|         |      |      |      |      |      |      |     |     |      |
|---------|------|------|------|------|------|------|-----|-----|------|
| EXT     | 05FA | 856# |      |      |      |      |     |     |      |
| FIF8    | 05EF | 854# |      |      |      |      |     |     |      |
| FALSE   | 0000 | 13#  | 14   | 615  |      |      |     |     |      |
| FCB     | 005C | 24#  | 25   | 620  | 623  | 643  |     |     |      |
| FCBCHK  | 0478 | 613  | 620# |      |      |      |     |     |      |
| FCBCR   | 007C | 25#  | 636  |      |      |      |     |     |      |
| FINIS   | 05D1 | 690  | 730  | 781  | 798  | 820# |     |     |      |
| FNMSG   | 05C6 | 803  | 813# |      |      |      |     |     |      |
| FSPACE  | 0793 | 796  | 898# |      |      |      |     |     |      |
| GDISK   | 0695 | 424  | 434  | 694  | 712  | 884# |     |     |      |
| GETC    | 034F | 415  | 421# |      |      |      |     |     |      |
| GETCHAR | 02DD | 329# | 407  | 445  | 454  | 475  | 550 | 679 |      |
| GETPRM  | 0660 | 405  | 882# |      |      |      |     |     |      |
| GETPUT  | 03C0 | 482# | 658  | 668  |      |      |     |     |      |
| GETSYS  | 04B2 | 622  | 653# |      |      |      |     |     |      |
| GETVER  | 0373 | 428  | 440# |      |      |      |     |     |      |
| HLREG   | 05EC | 850# |      |      |      |      |     |     |      |
| LF      | 000A | 46#  | 352  | 901  |      |      |     |     |      |
| LOADP   | 1000 | 27#  | 485  | 637  | 733  | 783  |     |     |      |
| LOG2SEC | 0007 | 21#  | 317  |      |      |      |     |     |      |
| LOOP2   | 0597 | 791# | 811  |      |      |      |     |     |      |
| MAKE    | 0320 | 390# | 778  |      |      |      |     |     |      |
| MAKEF   | 0016 | 36#  | 391  |      |      |      |     |     |      |
| MAXTRY  | 0001 | 44#  | 544  |      |      |      |     |     |      |
| MFCB    | 0503 | 703# | 710  |      |      |      |     |     |      |
| MLTBY3  | 01C2 | 166# | 196  | 221  | 245  | 269  | 289 | 309 |      |
| MULTSEC | 02D2 | 313# | 531  | 581  |      |      |     |     |      |
| NDISKS  | 0004 | 19#  | 414  | 458  |      |      |     |     |      |
| NODIR   | 0778 | 779  | 897# |      |      |      |     |     |      |
| NOFILE  | 0759 | 629  | 728  | 896# |      |      |     |     |      |
| NSECTS  | 001A | 17#  | 79   | 83   | 86   | 120  | 121 |     |      |
| NTRKS   | 0002 | 18#  | 78   |      |      |      |     |     |      |
| OLDRVR  | 0473 | 610  | 614# |      |      |      |     |     |      |
| OPEN    | 0316 | 381# | 624  | 727  |      |      |     |     |      |
| OPENF   | 000F | 33#  | 383  |      |      |      |     |     |      |
| OST     | 0180 | 78#  | 500  |      |      |      |     |     |      |
| OUTMSG  | 0302 | 362# | 437  | 444  | 549  | 603  | 660 | 670 | 765  |
| PDISK   | 06E6 | 468  | 716  | 771  | 888# |      |     |     | 822  |
| PUTC    | 03A3 | 459  | 465# |      |      |      |     |     |      |
| PUTCHAR | 02EB | 341# | 351  | 353  |      |      |     |     |      |
| PUTPRM  | 06A9 | 452  | 886# |      |      |      |     |     |      |
| PUTSYS  | 04C2 | 463  | 647  | 663# |      |      |     |     |      |
| QDISK   | 072B | 831  | 895# |      |      |      |     |     |      |
| ROR2    | 060F | 862# |      |      |      |      |     |     |      |
| RCC     | 05FD | 859# |      |      |      |      |     |     |      |
| RDINP   | 049A | 638# | 651  |      |      |      |     |     |      |
| RDOK    | 0493 | 626  | 634# |      |      |      |     |     |      |
| READ    | 0286 | 273# | 570  |      |      |      |     |     |      |
| READ2   | 02A1 | 279  | 286# |      |      |      |     |     |      |
| READF   | 000D | 55#  | 281  | 288  |      |      |     |     |      |
| REBOOT  | 05D4 | 411  | 447  | 456  | 477  | 552  | 631 | 681 | 824# |
| RETRY   | 0642 | 539  | 543  | 561  | 878# |      |     |     |      |
| RS      | 05FC | 858# |      |      |      |      |     |     |      |
| RW      | 063F | 562  | 657  | 666  | 876# |      |     |     |      |
| RWSEC   | 03DF | 510# | 556  | 573  |      |      |     |     |      |
| RWTRK   | 03CB | 496# | 586  |      |      |      |     |     |      |

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|-----------|------|------|------|------|------|------|-----|-----|-----|------|-----|--|--|--|--|--|--|--|--|--|
| SDISK     | 0638 | 870# |      |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| SEC       | 0229 | 225# | 527  |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| SEC2      | 024D | 231  | 242# |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| SECSIZ    | 0080 | 20#  | 649  |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| SECTOR    | 063E | 508  | 513  | 519  | 875# |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| SEL       | 01CA | 176# | 427  | 471  |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| SEL2      | 01EE | 181  | 192# |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| SELCT     | 0307 | 366# | 698  |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| SELD      | 000E | 32#  |      |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| SELDISK   | 0009 | 51#  | 187  | 195  |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| SETDMA    | 000C | 54#  | 261  | 268  |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| SETSEC    | 000B | 53#  | 237  | 244  |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| SETTRK    | 000A | 52#  | 213  | 220  |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| SFCB      | 05EE | 701  | 714  | 726  | 745  | 852# |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| SIGNON    | 0643 | 602  | 879# |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| SKEW      | 0002 | 22#  | 85   |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| SOURCE    | 032F | 404# | 419  | 654  | 692  |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| SPT       | 0181 | 79#  | 512  | 580  |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| STACK     | 0869 | 601  | 905# |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| STACKSIZE | 0016 | 47#  | 904  |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| START     | 0457 | 60   | 599# |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| TIT3      | 05F7 | 855# |      |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| TEMP      | 0637 | 177  | 180  | 202  | 205  | 227  | 230 | 251 | 254 | 275  | 278 |  |  |  |  |  |  |  |  |  |
|           |      | 295  | 298  | 869# |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| TPA       | 0100 | 26#  | 59   |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| TRACK     | 063C | 494  | 498  | 873# |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| TRAN      | 0182 | 80#  | 522  |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| TRK       | 01FA | 200# | 506  |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| TRK2      | 021E | 206  | 218# |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| TRUE      | FFFF | 14#  | 179  | 204  | 229  | 253  | 277 | 297 | 611 |      |     |  |  |  |  |  |  |  |  |  |
| TRYOK     | 042A | 545  | 558# |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| TRYREAD   | 043B | 564  | 569# |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| TRYSEC    | 040E | 541# | 576  |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| V3FLG     | 0636 | 178  | 203  | 228  | 252  | 276  | 296 | 612 | 616 | 868# |     |  |  |  |  |  |  |  |  |  |
| VERCR     | 037C | 438  | 445# |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| VERGET    | 068B | 436  | 443  | 883# |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| VERPUT    | 06D7 | 473  | 887# |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| VERS      | 001E | 3#   | 880  | 880  |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| WBOOT     | 0001 | 49#  | 194  | 219  | 243  | 267  | 287 | 307 |     |      |     |  |  |  |  |  |  |  |  |  |
| WRITE     | 02AC | 293# | 567  |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| WRITE2    | 02C7 | 299  | 306# |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| WRITF     | 000E | 56#  | 301  | 308  |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| WRPROT    | 07AD | 899# |      |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |
| Y         | 0059 | 42#  | 680  |      |      |      |     |     |     |      |     |  |  |  |  |  |  |  |  |  |

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